



Aligning to Learning

Standards:  
Number Sense

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# NCTM Principals of Math Instruction

- Equity

- Curriculum

- Teaching

- All students must have opportunity and support to learn mathematics
- Coherent, focused on important mathematics, well articulated across the grades . . prepare students to solve problems across settings
- Selecting suitable materials, tools, techniques to support learning & pursuing continuous self improvement



# NCTM Principals of Math Instruction

- Learning
  - Build new knowledge from prior knowledge: students learn more and better when they take control of their learning
- Assessment
  - Integral part of instruction . . . guides student learning
- Technology
  - Technology is essential in teaching and learning



# Teaching to NCTM Standards: What really works?

- **5 Component Skills**

- **Number and Operations**
- **Geometry**
- **Algebra**
- **Data Analysis**
- **Measurement**

- **5 Processing Skills**

- **Problem Solving**
- **Reasoning & Proof**
- **Communication**
- **Connections**
- **Representation**

# **Goal 6: Number Sense Arithmetic**

**Representation and Ordering**

**Computation, Operations,  
Estimation and Properties**

**Ratios, Proportions, and Percents**



# What is Number Sense?

Discovery Streaming Clip

# **Goal 6: Number Sense**

- **Identify numbers**
- **One-to-one correspondence**
- **Place Value**
- **Numerical order**
- **Numbers can be:**
  - **Numerals**
  - **Objects**
  - **Manual Sign**
  - **Pictures**

**Embedded into all components of Math Instruction**

# **Goal 6: Number Sense**

## **Key Ideas About Numbers**

**Numbers and operations are abstractions**

**All mathematical ideas require representations**

**Calculation requires algorithms**

**Domain of number supports and is supported by other branches**



# **Goal 6: Number Sense**

**What do students  
need to be successful  
in number sense?**

- ★ **Manipulatives or other visual representations**
- ★ **Practice with algorithms through games**
- ★ **An understanding of why algorithms work**
- ★ **General estimation skills to understand the reasonableness of their answers**

# Pre-K through 2nd Grade

- numbers and numeration
- counting
- representing and comparing quantities
- adding and subtracting
- Place Value and base-ten numeration
- early ideas about fractions (halves and fourths)

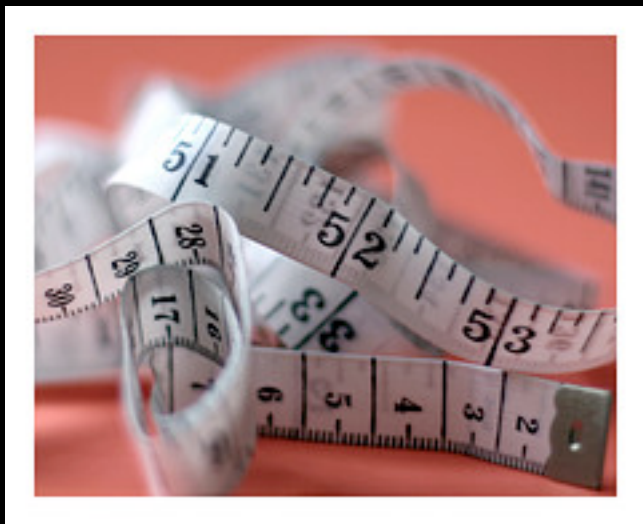


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# Grades 3 - 5

- Large whole numbers
  - fractions, decimals, percents and negative numbers
- Multiplication and Division
- Base-ten numeration
  - $(4 \times 100) + (3 \times 10) + (5 \times 1) = 435$
- Number line important
  - 1/2, 1, 10, 100, 500
  - Comparing fractions
- Parallel number lines
  - show multiples (1/3 and 1/6 equivalences)



# Grades 6-8

- Proportional Reasoning - understand and use ratios, proportions and rate to model and solve problems
- Fractions strips, circles, number lines, area models, hundred grids, and other physical models provide concrete examples
- Central component of objectives



# Grades 6-8

- Connection of Proportionality
  - Slope of the linear function  $y=mx$   
(*algebra*)
  - Circumference to diameter of a circle  
( $\pi$ ) (*geometry*)
  - Relative frequency of a statistic in a set of data (*data analysis*)





# Grades 6-8

- Notation of factors
- Multiple, prime and composite numbers,
- Factor trees
- Divisibility tests
- Special sets (square numbers)
- Interesting number patterns (irrational numbers introduced  $\sqrt{2}$ )



# Grades 9-12

Encounter problems with very large and small numbers

Use technology to display large and small numbers

Fluent in expressing and interpreting quantities

Work with irrational numbers

Develop awareness of the relationship of number systems

( $A+5=10$  has a whole number solution, but

$A+10=5$  does not have a whole number, but does have an integer solution)



# Grades 9-12

One to one correspondence between  
real numbers and points on a line

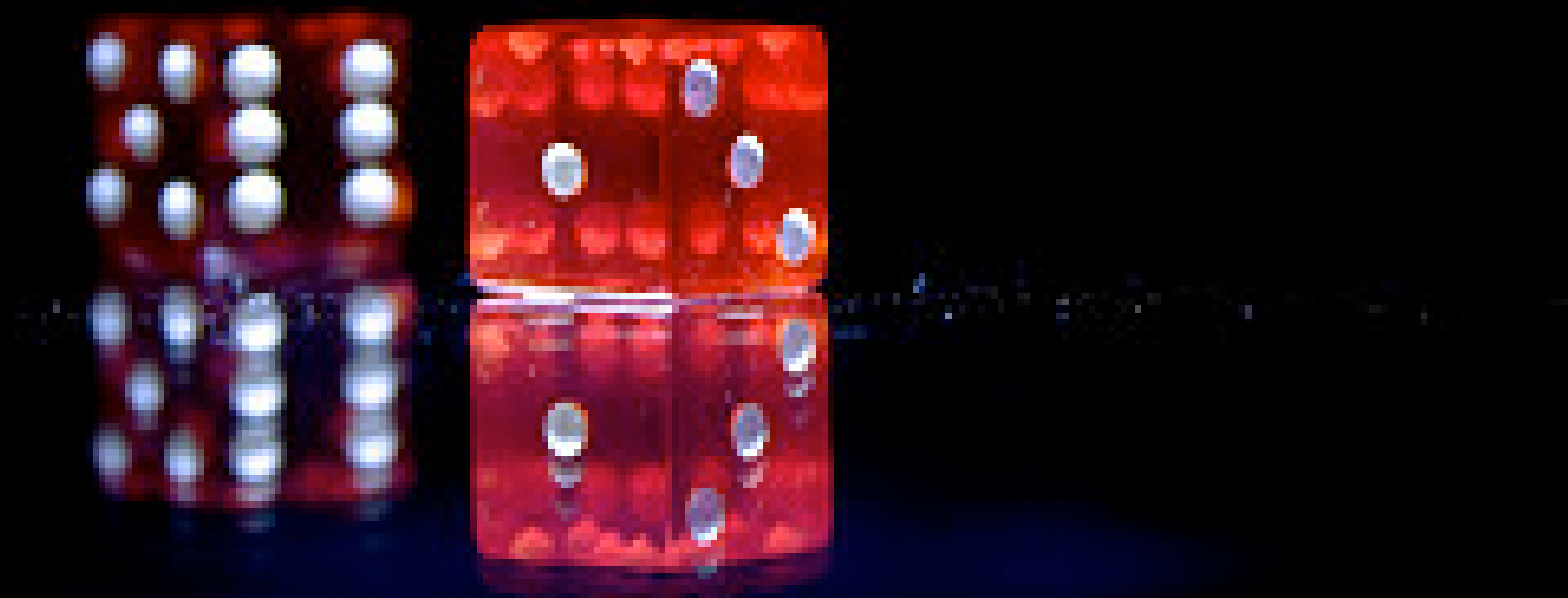
Vectors and matrices (explore and compare)

Associative, commutative, and distributive properties  
and will expand to investigate that multiplication is not  
commutative

Solve problems in other disciplines including economics  
and science

*NCTM, 2004. Navigation through number and operations in prekindergarden-grade 2*

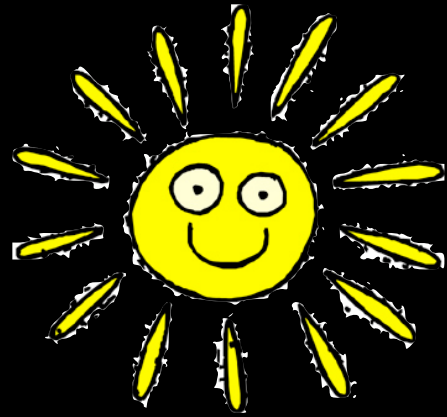
# ACTIVITIES



# Ten Little Animals







# Ten Little Animals



# Fish For Three





photo by Richard Bailey @ Flickr.com

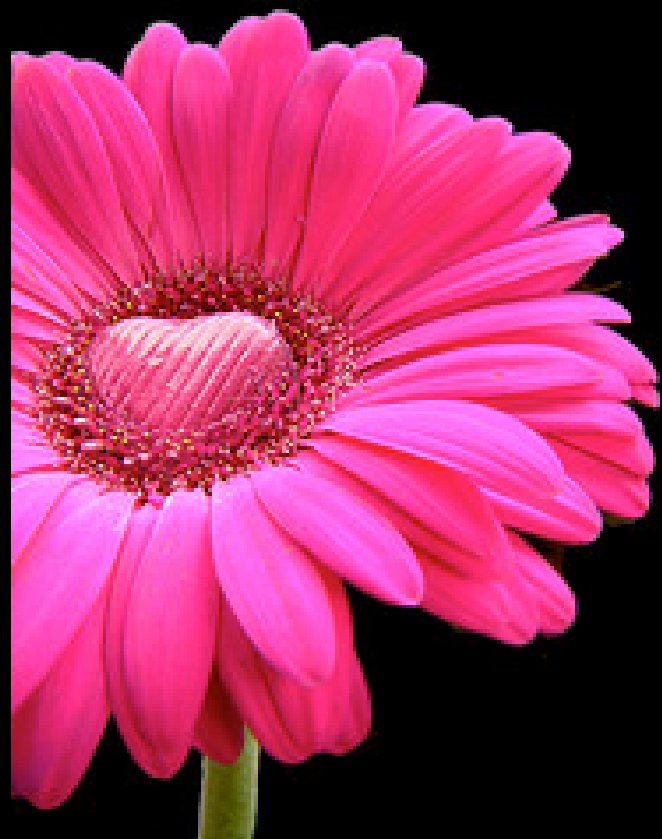
# 0 to 10

## Counting Book

Today, we discussed  
math curriculum ...

But to teach you need  
to remember to  
have ...





Heart first!